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The Probability Archive:
From Essence to Uncertainty in the Growth of Knowledge.

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The Internet Turning 40: The Never-ending Novelty of New Media Research.
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Abstract
From a 'cultural science' perspective, this paper traces one aspect of a more general shift, from the realist representational regime of modernity to the productive DIY systems of the internet era. It argues that collecting and archiving is transformed by this change. Modern museums – and also broadcast television – were based on determinist or 'essence' theory; while internet archives like YouTube (and the internet *as* an archive) are based on 'probability' theory. The paper goes through the differences between modernist 'essence' and postmodern 'probability'; starting from the obvious difference that in a museum each object is selected by experts for its intrinsic properties, while on the internet you don't know what you will find. The status of individual objects is uncertain, although the productivity of the overall archive is unlimited. The paper links these differences with changes in contemporary culture – from a Newtonian to a quantum universe, progress to risk, institutional structure to evolutionary change, objectivity to uncertainty, identity to performance. Borrowing some of its methodology from science fiction, the paper uses examples from museums and online archives, ranging from the oldest stone tool in the world to the latest tribute vid on the net.

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The Probability Archive

So remember, when you're feeling very small and insecure,
How **amazingly unlikely** is your birth,
And pray that there's intelligent life somewhere up in space,
'Cause there's bugger all down here on Earth. (Idle)[1]

1. Mental Jujitsu

If you followed *The Hitchhiker's Guide to the Galaxy* you may be familiar with Douglas Adams's 'Infinite Improbability Drive'. It is a nifty engine for getting a plot, not to mention one's lead characters, out of a dead end. This is the device I shall use to introduce my new concept to media studies: the *probability archive*, which we'll get to shortly.[2] But let's start with *im*probability:

> It is the infinite improbability drive in *The Hitchhiker's Guide to the Galaxy* that saves Arthur Dent and Ford Prefect from very probable death by asphyxiation in deep space.... [Douglas] Adams realized that he had worked the story into a dead end, thinking in frustration that the only solutions would be "infinitely improbable." In a flash of insight and what Adams called "mental jujitsu", the Infinite Improbability Drive was born.'[3]

This is the kind of *deus ex machina* that we need in order to get from (a) modernism, national cultural institutions and broadcast television, to (b) uncertainty, risk society and YouTube. When you think about it, this is indeed an improbable journey, but nonetheless one for which there is plenty of empirical evidence.

The causal link between the Infinite Improbability Drive and my new concept is *probability theory*. This branch of mathematics has had little impact on my 'home' disciplinary field (the literary humanities and creative arts), where high modernism can still get you tenure. So part of my purpose in this paper is to argue for a shift in our

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[1] The 'Galaxy Song' by Eric Idle, from Monty Python's *The Meaning of Life* (1983). See: www.youtube.com/watch?v=JWVshkVF0SY. And see my comment on this: http://mediacommons.futureofthebook.org/imr/2007/11/23/a-double-drabble-of-bugger-all-on-monty-python%E2%80%99s-galaxy-song

[2] Of course, there's nothing much that's new in media studies, especially now that we can search online for sources. I acknowledge at once that others have already navigated some of the pathways that I traverse here; in particular those working in internet studies such as Jean Burgess, Joshua Green, Alexander Halavais, Nancy Baym, and others.

[3] See *Wikipedia*: 'Technology in The Hitchhiker's Guide to the Galaxy' from which this passage is quoted.

'macro' disciplinary setting, from *modernist determinism* (linear or mechanical causal order) to *quantum probability* (chaos, complexity, uncertainty). At the 'micro' level, probability's time has certainly come in the archive business.

2. From objectivity to quantum theory

Changes can be observed in the organisation of knowledge by looking at differences in archiving and display systems in the most prominent cultural institutions – institutions of knowledge – of successive periods. Thus, put simply, the *modern* period was characterised by the museum; the *postmodern* by broadcasting; and the emergent *global network* system by the internet. Each type of archive is organised according to different principles. Thus:

- **Modern archives** (museums, galleries) were organised around the concept of *objectivity*. They were located in physical space, contained physical objects, and proposed a *mechanical* relation between the real and its representation. The *visitor* observes not a representation of the real but the real itself. The modern archive aspired to universal but coherently disciplined *knowledge*. These are what I call essence archives.
- **Postmodern archives** (broadcast TV systems) were organised around the concept of *mediation*. They were time-based, contained 'intangible' objects, and proposed – at least at the outset – a *realistic* relation between the sign and its referent. The *viewer* observes a representation that is motivated by a trace of the real within the sign. The archive aimed for indiscriminate but universal *audiences*. I call this an interim or transitional phase.
- **Network archives** (the internet) are organised around the concept of *probability*. They are digital, contain virtual objects, and propose an *uncertain* relation between what you see and what you get. The *user* co-creates content that may or may not be real. The archive aims for universally accessible and (re-)usable *content*. These are what I call probability archives.

The shift from Newtonian (mechanical) to quantum (probability) knowledge has been cumulative and historical, and the boundaries between the different types are not as clear-cut as the categorisation above implies. Nevertheless, I suggest that a transformation in the status of knowledge can now be observed in the difference between what I'm calling 'essence' and 'probability' archives respectively. 'Essence' archives are *object*-based; 'probability' archives are *user*-based.

In an 'essence archive' such as a museum or gallery, each displayed object is collected and selected by experts for its intrinsic properties, which are themselves scientifically verified.

There are elaborate systems in place to manage both the collection and its curators, with the emphasis on accuracy and expertise.

But in a 'probability archive' like the internet, you don't know what you will find or who put it there. The status or even existence of individual objects is uncertain. They may be real or unreal, true or false, fact or fiction, original or copy. The *productivity* of the overall archive is *unmanaged* – knowledge is uploaded, archived, organised, debated and deleted by myriad users, not by minority expertise.

Essence archives dominated *modern culture*, by which I mean Enlightenment-based industrialising countries of the modernising West. They were associated with the rise of mutually competitive nation-states during and following the nineteenth century. Probability archives are coming to dominate *global culture* and are a product of the collaborative network. They are associated with both global corporate culture (Google, Facebook, YouTube), and self-organised consumer co-created communities or what Charles Leadbeater has dubbed 'cloud culture'. [4]

For their part, broadcasting (cultural technology) and postmodernism (artistic-intellectual movement) may be seen – in hindsight – as *transitional* rather than transformational, an interim phase (rather like the so-called 'Gutenberg parenthesis')[5] between these two archival systems – a period of excess/collapse or what Yuri Lotman calls 'culture and explosion', presaging more fundamental rearrangements.[6]

Thus, broadcasting clearly contributed to the development of the network age, preparing the way for globally distributed hypertext in the separation of the sign from the referent, leading to 'semiotic excess' (where signification is no longer anchored to 'the real'); and rehearsing, via media-connected 'imagined' if not 'virtual' communities, the type of social networks that would later dominate the internet. But at the same time, broadcast television relied on the same industrial-era mode of corporate organisation as other kinds of modern archive. It was a closed expert system where producers (collectors and curators) were radically separated from consumers, and where control over what was gathered or produced, and how it was presented, remained at all times with the professionals.

This paper suggests that the transformation of archival systems, relations and practices (taking place over the past century or so) can be characterised as a change in underlying

[4] Charles Leadbeater (2010) *Cloud Culture: Promise and Danger.* British Council: Counterpoint: www.counterpoint-online.org/cloud-culture-promise-and-danger/.
[5] For Thomas Pettit's notion of the Gutenberg parenthesis, see: See: http://web.mit.edu/comm-forum/forums/gutenberg.html.
[6] Yuri Lotman (2009) *Culture and Explosion.* Trans. Wilma Clark. Berlin, Mouton De Gruyter.

theories of causation. Modern or 'essence' archives were organised according to *objectivity theory*, where the intrinsic properties of an object directly *cause* what it 'means'. Network or 'probability' archives are founded on the principle of uncertainty, where meanings may vary according to their position, momentum, and a version of the 'observer effect'. In short, they are organised according to *quantum theory*.

3. Modernity's Essence Archive

The *essence archive* is a *deterministic* type of store, based on a Newtonian, mechanical or linear theory of causation.

The cultural institutions whose emergence accompanied the rise of the nation state in the nineteenth century,[7] are nowadays collectively known as the GLAM sector, i.e. Galleries (artworks), Libraries (publications), Archives (documents) and Museums (artefacts). These are all essence archives. They collect, conserve and curate individual objects whose value is intrinsic to the object: this Rembrandt is not a fake; that book is not plagiarised; those manuscripts are original; our artefact is not a cast. Each object is objective; its properties can be determined by empirical observation. Essence theory requires that every object is explicable by its intrinsic properties.

A good example of an essence archive is the British Museum (BM).[8] The whole point about the artefacts in the BM is that they are what they appear to be – all real, no sign. For instance, the oldest object in the Museum, the first known technological invention (and therefore earliest precursor of the internet), is the Olduvai stone chopping tool (Fig. 1).

[7] See: Tony Bennett (1995) *The Birth of the Museum, History, Theory, Politics.* London: Routledge.
[8] BM = British Museum. Not to be confused with the gloss given to BM by the *Urban Dictionary*, where BM = Bowel Movement or Bodily Motions (www.urbandictionary.com/define.php?term=B%20M).

Fig. 1: Olduvai stone chopping tool in the British Museum. Source: www.bbc.co.uk/iplayer/images/episode/b00pwn7m_640_360.jpg

The important thing about this bit of basalt is its *essence* – it alone, and not any other thing, is the oldest wrought object, so old that it pre-dates our species. It was made nearly two million years ago by the earliest hominid, *homo habilis*.[9] This claim is based on its *essential* or intrinsic properties, established by various scientific tests, whose importance is emphasised in the BM's online catalogue.[10]

4. Broadcast TV as Essence Archive

The difference between 'public culture' and 'private entertainment' has been a continuing rift throughout the modernist era, making it seem that there is little in common between national GLAM cultural institutions and commercial pop-culture media. But I argue that *broadcasting* too is an essence archive, even though it is time-based rather than bricks-and-mortar, and not so much a store as a stream.

Broadcast TV trades in individual shows, owned by the exhibiting institution (TV Channel) not private collectors. Each program has its own intrinsic value, merit, or generic properties, and although viewers can choose among different channels, each show is produced, paid for and watched on the basis of its essential merits, which viewers can only experience one at a time.

For example, when an individual show is on (which is all the time), let's say it's *Dr Who*, viewers know:

(a) that it is on here and now, not some other channel or time;
(b) that it is *Dr Who* (series so-and-so; episode such-and-such) not some other show; and
(c) that it *really is Dr Who*, not a tribute, spoof, rip-off or pirated copy.

Thus – while we're on the subject of stone – one of the most-praised episodes of *Dr Who* in recent years is *Blink* (series 3 with David Tennant, 2007).[11] It co-stars Oscar-nominated Carey Mulligan and features some of the scariest 'stone chopping tools' you'll ever meet –

[9] See: www.clas.ufl.edu/users/krigbaum/proseminar/leakey_etal_nature_1964.pdf.
[10] 'Olduvai stone chopping tool, from Olduvai Gorge, Tanzania, 1.8-2 million years old. Made nearly two million years ago, stone tools such as this are the first known technological invention. This one is the oldest object in the British Museum': www.britishmuseum.org/explore/highlights/highlight_objects/pe/s/olduvai_stone_chopping_tool.aspx.
[11] See: www.dr-who.tv/Doctor_Who_Episode_Guide/Blink

aliens that look like marble statues of angels, which move when you're not looking, and kill you if you blink (Fig. 2).[12]

Fig. 2: *Blink* (*Dr Who*): 'Don't blink. Blink and you're dead.' Source: *www.bbc.co.uk/doctorwho/dw/news/bulletin_100203_01.*

Like the Olduvai stone chopping tool, *Blink* is valued *as such*, for its essential, intrinsic qualities as an individual episode, albeit of a series that goes back forty years, in a crowded TV schedule with myriad competing attractions. Fans loved it,[13] it won industry prizes,[14] and the 'weeping angels' were revived in series 5 (Matt Smith/Karen Gillan 2010).[15]

I'm trying to suggest that despite their different technologies and histories, and their sometimes daggers-drawn mutual relationship, the *value proposition* of the broadcasting system is the same as that of GLAM archives. Like artworks, books, documents, and artefacts, TV shows are exhibited on the basis of the intrinsic merit and attractiveness of the individual item.

Further, like GLAM collections, BTV is *provider-driven*. Experts in production (collecting), programming (curating) and promotion (audience maximisation) are hired and fired on the basis of their value to the production process, which is corporately controlled and often vertically integrated, so that the same organisation owns each step of the process from inception to transmission, and that includes control of a 'catalogue' of

[12] See: www.youtube.com/watch?v=lzWiSbL8pbw. The 'Weeping Angels' are themselves a victim of Eisenberg's uncertainty principle. They are 'quantum locked' – their speed is infinite when unobserved, but they cannot move when watched (See: scyfilove.com/2058/the-weeping-angels-doctor-who-return-intrigues-blink-star-finlay-robertson/; and see: Wikipedia, Quantum Zeno Effect). The end of the episode suggests that viewers might want to be careful about blinking in front of some famous statues (see: www.flickr.com/photos/8047619@N08/544264972/).

[13] See for instance: www.therpf.com/showthread.php?t=49264; and the reviews on Amazon.com: www.amazon.com/Doctor-Who-Complete-David-Tennant/dp/B000UVV2GA.

[14] See: www.bbc.co.uk/doctorwho/s4/news/080512_news_01.

[15] See:: www.youtube.com/watch?v=r_jxOx0CMKA.

shows, series, movies or presenters that amount to an evolving archive to which the corporate owner alone has access, releasing items on a schedule that suits their own purposes, not necessarily those of viewers, although they employ yet more experts to keeps these divergent desires in some sort of alignment.

Thus, broadcast TV and cultural institutions are both 'essence' storehouses from which viewer-visitors can choose among 'content' that is already created, collected, curated, verified, valued and publicly released by experts. The first loyalty of the professional is to the corporate provider or sponsor, not directly to the viewer-visitor. But the broadcasting organisation prospers only to the extent that its range of experts and its repertoire of items are wide enough to persuade a sufficient number of casual visitors to stop by – here, and now – for some 'essential viewing'.

From the point of view of the audience, broadcast TV's attraction is also similar to that of a museum. If you think this is far-fetched, remember that despite their high-culture tone, museums and art galleries are among the most popular tourist attraction in world-cities, attracting much the same mixed demographic as does TV.[16] The experience of the 'content' from the perspective of the visitor-viewer is also comparable. To access what one wants it is necessary to visit the institution (in time for TV; in place for GLAM). Each visit is competitive, because there is always the option of going elsewhere. But once the decision is made, whether it's the BM or the BBC, it is time-bound. Viewers can choose to spend that time with old favourites or interesting new possibilities in a way that is idiosyncratic but nevertheless part of a large-scale popular experience. The 'venue' is full of other people, unknown to and minimally interacting with each other, as each makes their chosen pathway through the content. In both cases enjoyment is centred about an object that cannot be 'consumed' in the literal sense because the viewer-visitor never owns it. The motivation is the same in both cases: *this* object (or show ... or any other choice) is preferred over *that* one, in an experience that is nevertheless casual, non-committal, and non-instrumental.

5. The Derrida Effect

The journey from modernism to probability was itself improbable. Modernism got stuck when science and reason turned into their own hideous opposite during the era of totalitarianism and Holocaust. As Kurt Vonnegut observed, we 'began to have doubts

[16] The Visit London site lists the British Museum, Tate Modern, National Gallery, Natural History Museum, London Eye, Science Museum, Victoria & Albert Museum, Madame Tussauds, Tower of London and National Maritime Museum as London's 'top 10 attractions ... in order of popularity based on visitor numbers' (www.visitlondon.com/attractions/culture/top-ten-attractions). Only of them (the Eye) is unequivocally not a 'GLAM' attraction.

about truth after it was dropped on Hiroshima'.[17] It seemed that Enlightenment rationality had been a delusion. People who 'believed in' progress had forgotten that modern science – Newtonian mechanics – requires that 'to every action there is always an equal and opposite reaction'.[18] It became increasingly clear that 'our' progress entailed 'their' destruction, enslavement and environmental degradation, where 'they' = excluded humans and the entire non-human biota.[19]

Faced with this, you might have expected progress itself to stall. But not a bit of it. The 'equal and opposite' reaction to 'progress' turned out not to be stopping but, counter-intuitively, a *power law* rate of *acceleration*.[20]

'Progress' went into Infinite Improbability Drive – what Paul Virilio identified long ago as 'the Order of Speed'.[21] Acceleration occurred in two overlapping but distinct systems at once, although at different rates:

- **The Real:** On the economic front, *capitalism* soon achieved warp factor 1 – the speed of light – by transferring productivity from *things* (industrial manufacturing) to *information* (the knowledge economy).
- **The Sign:** *Ideas* achieved even greater acceleration. In the latter part of the twentieth century they reached *postmodern* speed. Postmodernism worked like the Starship *Enterprise*. Ideas could travel at faster-than-Newtonian velocity, but they were still rational, individual, essential ideas, determined by causal sequence, thus (Fig. 3):

[17] Kurt Vonnegut (1981), *Palm Sunday: An Autobiographical Collage*. London: Jonathan Cape, p. 223.
[18] 'Lex III: *Actioni contrariam semper et æqualem esse reactionem: sive corporum duorum actiones in se mutuo semper esse æquales et in partes contrarias dirigi*. To every action there is always an equal and opposite reaction: or the forces of two bodies on each other are always equal and are directed in opposite directions' (Wikipedia: Newton's laws of motion).
[19] See: Georgio Agamben (1998) *Homo Sacer*; Cary Wolfe (2009) *What is Posthumanism?*
[20] For the importance of power law distributions on the web see Alexander Halavais (2009) *Search Engine Society*. Cambridge: Polity Press, ch. 3. And see: http://onlinejournalismblog.com/2009/07/14/review-search-engine-society-by-alexander-halavais/.
[21] Paul Virilio (1977) *Vitesse et politique*. Paris: Galilee: 'Let's not kid ourselves ... [with the] drop-out, beat generation, motorists, commuters, tourists, the Olympic Games, travel agents, etc., the military-industrial democracies have managed to transform all social categories into the unknown soldiers of the Order of Speed' (p. 120). Virilio coined the term 'dromology' for the 'science of speed'. For an overview see John Armitage (2000) 'Beyond Postmodernism: Paul Virilio's Hypermodern Cultural Theory'. *ctheory.net*: www.ctheory.net/articles.aspx?id=133; and see: Paolo Prato & Gianluca Trivero (1985) 'The Spectacle of Travel' (translated by Iain Chambers). *Australian Journal of Cultural Studies*, 3:2, 25-42: wwwmcc.murdoch.edu.au/ReadingRoom/serial/AJCS/3.2/Prato.html.

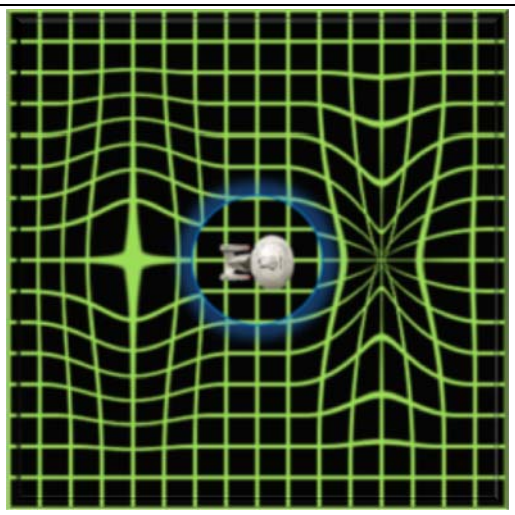


Fig. 3: A visualization of a warp field. The ship rests in a bubble of normal space. Source: Wikipedia: Warp drive (Star Trek)

Postmodernism was simply modernism travelling at warp factor > 1. At that speed, signifiers became detached from signifieds and the resultant *abstraction of the sign* induced arbitrariness of meaning until *relativity speed* was reached, at which point 'the real' dissolved but reason could still travel safely through it. We can call this the 'Derrida effect'; reason taken to such excessive extremes of 'creative deconstruction' (as it were) that renewal is mistaken for fiction.[22]

But even postmodernism was slow compared to the Infinitely Improbable position – or is that momentum? – in/at which we now find ourselves. Suddenly we find ourselves slap bang in the middle of the universe of quantum indeterminacy and stochastic random probabilities, a place where Bayesian inference, Heisenberg's uncertainty principle, and Schrödinger's cat rule the waves,[23] where you can exist (or not) everywhere (and nowhere) at once.[24]

Here is where we encounter the emergent *probability archive*.

6. The Probability Archive

[22] 'Creative destruction' is Joseph Schumpeter's term for the restless renewal of capitalism via entrepreneurial risk; 'deconstruction' is Derrida's method of reasoning for the renewal of Western philosophy. See: Thomas McCraw (2007) *Prophet of Innovation: Joseph Schumpeter and Creative Destruction*. Cambridge, MA: Harvard University Press; and see: Niall Lucy (2003) *A Derrida Dictionary*. Oxford: Wiley-Blackwell.

[23] Bayes: www.youtube.com/watch?v=_RLb58eoEco; Heisenberg: www.youtube.com/watch?v=KT7xJ0tjB4A; Schrödinger: www.youtube.com/watch?v=EN-jCuV7BoU.

[24] See Michael Brooks (2010) 'Weirdest of the weird: From undead cats to particles popping up out of nowhere, from watched pots not boiling – sometimes – to ghostly influences at a distance, quantum physics delights in demolishing our intuitions about how the world works.' *New Scientist*, 8 May, 36-42 [cover story].

It took a century or more for the sign to be abstracted from the real; and also for quantum theory to ripple out from physics and mathematics to media and the market. Physics (matter) shifted from Newtonian mechanics to quantum uncertainty around the time of World War I – the well-known names are Niels Bohr, Werner Heisenberg, Max Planck. Language (postmodernism) went uncertain in the 1960s and 70s – the well-known names are Barthes, Baudrillard, Derrida, Foucault. But commercial investment in probabilistic technology didn't catch up until the internet was at last able to accommodate video – a moment best marked by the launch of YouTube in 2005.

Once emancipated from the burden of realist representation, the sign was now able to travel much faster than the mere speed of light. With the assistance of the internet's World Wide Web and Web 2.0, everyone could be everywhere, all the time, navigating with Infinite Improbability Drive.

The archive evolved too. The 'holotype' or first-described specimen of a *probability archive* was YouTube, the first book-length analysis of which, by Jean Burgess and Joshua Green, appeared in 2009.[25] Although its content is random and chaotic (no-one plans or manages what is uploaded) the probability is high that you'll find something related to what you're looking for, including the thing itself, often uploaded multiple times by different users. For instance, you can find out quite a lot about the examples mentioned so far, stone chopping tools from Olduvai to *Blink*, including chunks of the episode itself, uploaded by fans.[26] You'll also find lots of other things, such as tribute vids, 'related' content, reviews, links, and users' comments.[27]

So here emerges a different philosophy of collecting. Where the essence archive is devoted to an ideology of the coherent object, YouTube is organised around 'found objects' (i.e. the results of search functions or tags) – the probability of finding a specimen of a certain class rather than the certainty or essence of individual identity aspired to by museums and broadcasting.

YouTube is a dynamic and evolutionary environment. Clips are not only added but they are also constantly removed, as for instance when the corporate lawyers for a particular property trawl through the archive issuing take-down notices. Under pressure from the copyright enforcement lobby, YouTube has recently introduced automatic detection and removal technologies. Where it was possible for copyright material to be uploaded by

[25] Jean Burgess & Joshua Green (2009) *YouTube: Online video and participatory culture.* Cambridge: Polity Press.
[26] E.g. 'start of dr who blink': www.youtube.com/watch?v=wvp1Y7SZVhA.
[27] A tribute vid using *Blink* and Robbie Williams's 'Angels': www.youtube.com/watch?v=O-WkhGwIGo4; one of the comments it provoked was from a frustrated seeker of essence: 'im getting so pissed off every1 says that its real creepy but i can only find things like this with music i want the actual episode!!!'

anyone and to remain accessible unless YouTube ordered it to be taken down, now the onus is on users to inform YouTube that automatically deleted material may be covered by 'fair use' provisions and should therefore be restored. Thus uncertainty is structured into the very process of archiving. No-one – not the uploader, the copyright-holder, or the platform owner – knows if a given item will survive to be seen by others.

This is galling if you link a YouTube item to another website and it is subsequently (and silently) deleted. I found this out when I found a YouTube clip of an old cinema newsreel, showing Brisbane's first experimental TV broadcast in 1934. I linked it to a research site called *TVLandAustralia.com* that I'm developing for an ARC Discovery project. The clip was an excellent resource for historians of television, place, and popular memory. It attracted further information and comments on both YouTube and on our site, including entries by relatives of those who had taken part in the experiment.[28] But then it suddenly disappeared, 'due to "terms of use violation".'

Thus YouTube is an *unreliable* archive. You never know what you'll find or not find, and the archive changes constantly. A probability archive is random, complex, uncertain, indeterminate and evolving as to its contents at any given moment. But it is also contains much more information than a regular archive can manage: by YouTube's fifth birthday, it was estimated that 24 hours of footage were uploaded each minute, and it received two billion views a day (Fig. 4).[29]

[28] See: www.tvlandaustralia.com/uploadmemories/?p=43

[29] James "Dela" Delahunty (17 May 2010) 'YouTube celebrates 5th birthday, gets two billion views daily.' *AfterDawn.com News*: www.afterdawn.com/news/article.cfm/2010/05/18/youtube_celebrates_5th_birthday_gets_two_billion_views_daily

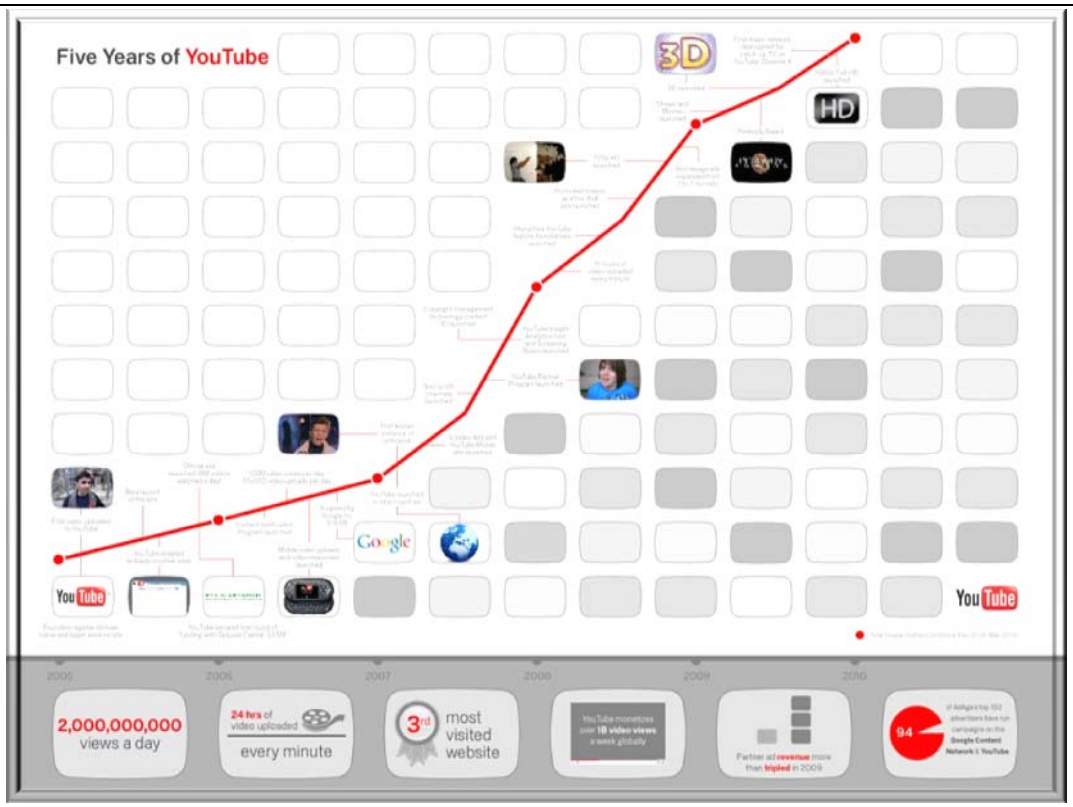


Fig. 4: Five Years of YouTube. Source: http://i.afterdawn.com/storage/pictures/1024/five_years_of_youtube.png

This productivity is only possible because it is *not* managed at the level of the individual item. So little were YouTube's founders concerned with 'essence' that didn't know what the site as a whole was *for* – they let *users decide on its purposes* for themselves. As a result, while YouTube as such remained purposeless, apart from attempted monetisation via advertising, introduced in 2006, it was able to accommodate myriad purposes. It is therefore not trading on the 'essence' of its content, but on the 'probability' that users will find – or make – what they want independently of the will of the 'provider'.

This results in a self-organising system of increasing but self-managed complexity. The archive is a mixture of user-uploaded content, often copied from television or music videos, corporately uploaded content seeking an audience, and user-created content – which is itself often a hybrid of copied and creative elements, typically using video from TV, music from a commercial playlist, mixed and edited to produce something new by 'vidders' who may themselves attract large followings for their work. Uniquely for a 'mass medium' (if that is what it is), YouTube has prospered by allowing professional and amateur content to cohabit.

Non-professional users may upload clips of favourite TV shows or music videos, both to *signal* their personal taste, socio-political affiliations or even their sense of identity, and also to *share* with others a sense of community or relationship, often by posting clips that

comment on news events (politics, disasters, sport), thereby using 'content' that is formally the property of corporate media firms (who regard its re-use as theft) to 'signal, share and save' – to *archive* – their own private lives, loves and loathings.

Then there are the more active users who make their own content, whether it is air-guitar sessions in the teenage bedroom (the classic Hey Clip) or hilarious home-made comedy (Mychonny).[30] Some of this stuff is so popular that it out-rates commercial entertainment.

Commercial interests also use YouTube for various purposes, including profiling, branding, audience-building, long-tail or niche marketing, education, community service initiatives or campaigning. Recently, led by Britain's Channel 4 Television, broadcasters have started to make revenue-share deals with YouTube to allow free access to popular shows – this is called 'catch-up TV' or VOD (Video on Demand), making YouTube an *archive* for broadcasting itself. Reliability of content is gained, but only by ceding control over what is uploaded (and why) to the copyright-holding corporate provider.[31]

Another important function for YouTube is the distribution of not-for-profit content. Neither consumerist nor commercial, this may range from highly professional educational or public-service material such as TED, to localised community-building by non-professionals and activists.

7. Plenitude of the sign

Going back in time to the essence archive, it is easy to see – now that we're all familiar with an alternative, although it wasn't so obvious during modernism's monopolistic heyday – that *essence* is not really what it has been made out to be. Once we've been alerted to the vagaries of a probability archive, it seems increasingly doubtful whether it has ever been possible to be sure that such a thing as 'this object' *really exists* in the essential or deterministic way that motivates the very idea of the modernist archive. For it was right there, inside the museum itself, that *what it is* (the real) began to part company from *what it means* (the sign).

It's no good blaming postmodernism for this. That much maligned phase in the growth of knowledge simply revealed (and played around with) what was already going on. Take once again the case of the most 'original' real human-made object, the Olduvai stone. Its

[30] For examples, see John Hartley (2010) 'Silly Citizenship.' *Critical Discourse Studies*, Vol. 7 No. 4.
[31] Emma Barnett (18 Oct 2009) 'Is Channel 4's 'catch-up' TV deal with YouTube a new watershed? Last week Channel 4 became the first broadcaster in the world to make its "catch-up" schedule available on YouTube free of charge.' *Daily Telegraph:* www.telegraph.co.uk/technology/google/6367931/Is-Channel-4s-catch-up-TV-deal-with-YouTube-a-new-watershed.html.

'essence' isn't enough to guarantee its unique status. That has to be *signalled* by means of theatrical isolation in a large display case (Fig. 5). It has to be *narrated* in order that its story can be *known.* Thus, it has been immortalised in a BBC 'History of the World.'[32]

Fig. 5: Olduvai stone chopping tool displayed in the British Museum (with others in the background). Picture: author

Already, even within the museum, 'the real' is transforming into 'the sign' in front of our very eyes. What's more, it transpires that this *ur-text* or holotype of all technology is far from unique. In fact the BM itself has several.[33] I have also seen the 'same' stones in the National Museum of Denmark (Fig. 6),[34] and doubtless you can find them elsewhere too (check your local museum or department of anthropology).

Fig. 6. Olduvai stone tools, and more from Java and France, at the National Museum of Denmark. Pictures: author.

[32] See: www.bbc.co.uk/ahistoryoftheworld/objects/ykHw5-oqQEGFnvat1gavxA.

[33] 'In these early artefacts it is possible to see the first spark of creative genius that set humans apart from other animals and gradually enabled us to adapt to different, often changing conditions all over the world.' See: www.britishmuseum.org/explore/highlights/highlight_objects/pe/s/stone_chopping_tools.aspx.

[34] www.natmus.dk/sw20374.asp.

In the end, then, the intrinsic properties of an individual item are not what make it important. What counts is *our experience of it* as unique and original.

Museums are location-based and analogue archives, so if enough people around the world are going to be able to experience it, the object 'itself' has to be multiplied and distributed, rather as chunks of moon rock were chopped up and sent around the world – to universal wonder – in the 1970s.

If enough examples of a certain object are found, the individual essence of each item is compromised. The museum display itself begins to signify *plenitude*, emphasising not uniqueness but variety and patterns (Fig. 7).

Fig. 7: Evolving towards a probability archive: On the left, stone tools; on the right, copper longship models. National Museum of Denmark. Pictures: author.

What we feel, therefore, as we stand in front of the display case in Bloomsbury or Copenhagen (etc.) is not 'the real' (the point of origin; the beginning of the causal chain of technology) but 'the sign'. However, there is clearly a law of diminishing returns in relation to the signifying power of the individual object. Thus, when a museum has lots of examples of a stone chopping too, the display starts to signify 'pattern' rather than 'essence' (Fig. 7).

Similarly, moon rock drew round-the-block crowds to my local museum, the National Museum of Wales/Amgueddfa Gendlaethol Cymru, when it was first displayed (Fig. 8).

Now you can buy it online for forty bucks, and NASA gives chunks of it away – for example to Neil Armstrong, who named his sample 'Bok'.[35]

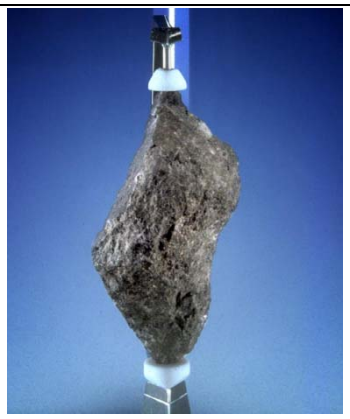


Fig. 8: Moonrock displayed at National Museum Cardiff. Source: www.museumwales.ac.uk/en/Rhagor/article/moonrock/

So the trick – the professional expertise of the GLAM archive – is not to collect, preserve and display essence, but to find ways to *signal* it. The combined weight of expert skill and corporate organisation is devoted to 'providing' a feeling *about* essence. The 'preferred reading' of the 'motivated sign' (as media scholars used to say)[36] is not the certainty of essence at all. It's a feelings of awe that may well up if you, 'dear viewer', in a competitive semiotic environment, are willing to treat this item *as if* it is the first human tool.

8. Re-reading 'essence.'

In the light of this, let's go back to the 'essence archive' and reappraise what has happened to it in the face of such semiotic competition. The British Museum for instance now offers more than a wondering gaze *at* a stone. The experience-seeking visitor can wield their own 'stone chopping tool' by taking carving lessons in workshops held under the colonnade of the Museum's grand entrance (Fig. 9). Not surprisingly, even at £35, these day-long events are sold out months in advance:

> **Stone carving**
> This workshop is designed for beginners, but more experienced carvers are welcome. Following an introduction to tools and materials, you will find out how stone carving was important in the Italian Renaissance and you will work on a relief inspired by the classical Greek figurative sculpture in the Museum. Wear old clothes and bring a bag to take away your finished piece. Tutor: Marcia Bennett-Male, Arts Express.[37]

[35] See: Wales: www.amgueddfacymru.ac.uk/cy/Rhagor/erthygl/carregllauad/, www.museumwales.ac.uk/en/Rhagor/article/moonrock/; $40 moon rock: (www.meteorites-for-sale.com/catalog/moon-boxes.html); Armstrong: (www.space.com/news/cs_060814_armstrong_bok.html).
[36] David Chandler (2002) *Semiotics: The Basics.* London: Routledge, p. 235.
[37] www.britishmuseum.org/whats_on/events_calendar/courses/stone_carving_workshop_3.aspx

Fig. 9. Stone cutting class at the front entrance of the BM, October 2009. Picture: author.

But if you want to make a real Palaeolithic stone chopping tool, it might be best to go to the American Museum of Natural History, whose website offers this advice (see Fig. 10):

> HOW TO MAKE A STONE TOOL
> 'Turning an unformed stone into a sharp tool requires hitting the stone at just the right angle and in just the right location.
> 1. Using a stone for a hammer, strike the surface of a rock at one end to remove a flake.
> 2. Turn the rock so the broken surface faces up, and strike again to leave a sharp edge and a flake that can be further shaped for different uses.'

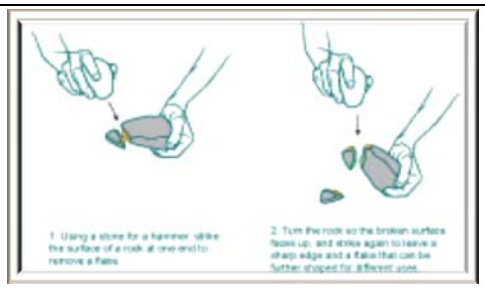


Fig. 10. How to make a stone tool. American Museum of Natural History: www.amnh.org/exhibitions/permanent/humanorigins/history/early.php © AMNH Exhibitions

9. *The Internet as a Probability Machine*

Of course I can only tell you about some of these developments by looking them up online. Here, you can feel the incredible power of probability.

You want stone chopping tools? We got 'em – in spades!

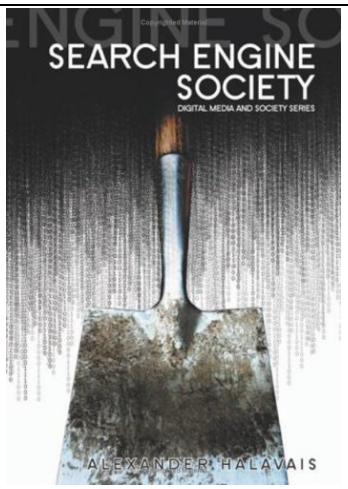


Fig. 11: The Search Spade. Source: http://onlinejournalismblog.com/2009/07/14/review-search-engine-society-by-alexander-halavais/

Here's one on Flickr. Someone has taken a picture of the 'Homo Ergaster' exhibit in the Spitzer Hall of Human Origins at the American Natural History Museum in NYC. It is a *dramatisation* or re-enactment of the Olduvai stone chopping tool, showing an early hominid holding it. [38] Someone else has uploaded the same picture and put a 'lolcats'-type caption on it: 'Homo Ergaster couple hailing a cab' (Fig. 12).


Fig. 12: 'Homo Ergaster couple hailing a cab.' Source: www.flickr.com/photos/8309065@N04/657464686

[38] See: www.flickr.com/photos/wallyg/404063706/ for the exhibit shown 'straight.' For lolcats see www.lolcats.com/.

Meanwhile, if you are interested in the actual place where this scene is imagined to have occurred, Olduvai Gorge in Tanzania, where the stone chopping tools were found, there are several videos from there, taken by tourists who captured both pictures of the setting and audio of the guide's commentary.[39]

You can gain a better understanding of the import of these discoveries, some of the science involved in finding them, and the cumulative theory-building process to which their discovery has contributed, if you listen to Louise Leakey, descendant of their discoverer, giving a TED talk (Fig. 13):[40]

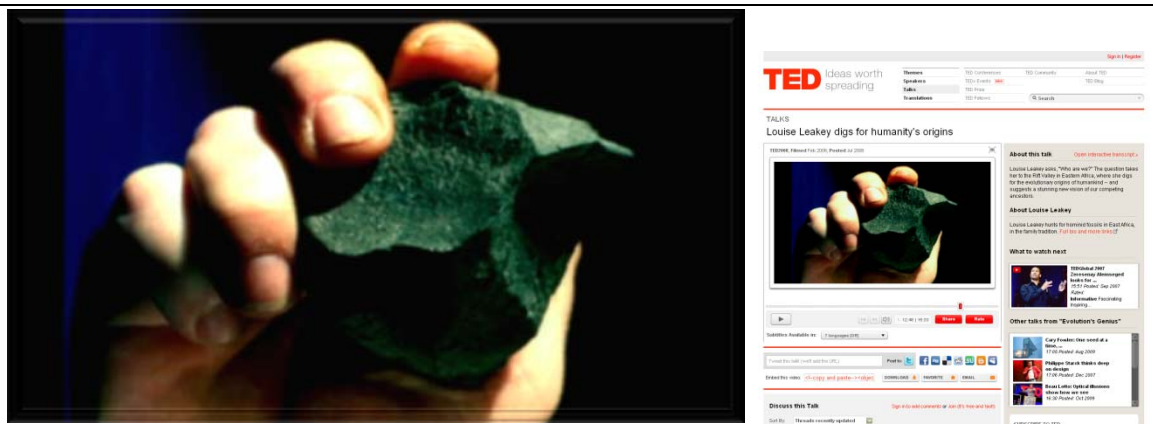


Fig. 13: Louise Leakey digs for humanity's origin. Source: TED Talk 2008

In keeping with the shift from essence to experience, original to reproduction, expertise to DIY, you can learn how to make your own stone chopping tool, guided by several YouTube videos.[41] Here is a clear instance of where the audio-video internet has a clear advantage over print-based or static-display museums. It's much easier to follow the actions of a practised flint-knapper on YouTube than to follow written instructions from the ANHM.

But if you're still not confident about our own flint-knapping abilities, you can buy a cast of an Olduvai stone tool, costing US$14.[42] The firm that supplies the casts also provides an accompanying web page that explains the story of the stones (Fig. 14). The illustrations

[39] See: Olduvai Gorge, Tanzania: www.youtube.com/watch?v=vMrPJlt1CY8; and The Scoop on Olduvai: www.youtube.com/watch?v=umwuqAljFVo.
[40] Louise Leakey's TED Talk: http://video.google.com/videoplay?docid=-3334028809823553219#. 'Louise Leakey asks, "Who are we?" The question takes her to the Rift Valley in Eastern Africa, where she digs for the evolutionary origins of humankind -- and suggests a stunning new vision of our competing ancestors.'

[41] See: 'Techniques for Flintknapping: How to Make Stone Age Tools': www.youtube.com/watch?v=-cHM8rfmQII; and see: 'Native Ancestral Skills: Stone Tools from Franciscan Chert': www.youtube.com/watch?v=yBbjP9aCbG.
[42] See: OLDOWAN FLAKE TOOL, LOWER PALEOLITHIC, OLDUVAI GORGE, TANZANIA AFRICA: http://lithiccastinglab.com/cast-page/oldowanflaketoolcast.htm.

are credited to the University of California-Berkeley, Dept. of Anthropology Collection. The site as a whole belongs to one Peter A. Bostrom. It claims to have received nearly 40 million hits in a little over seven years.[43]

THE OLDOWAN STONE TOOL INDUSTRY
1.5 to 2 MILLION PLUS YEARS AGO

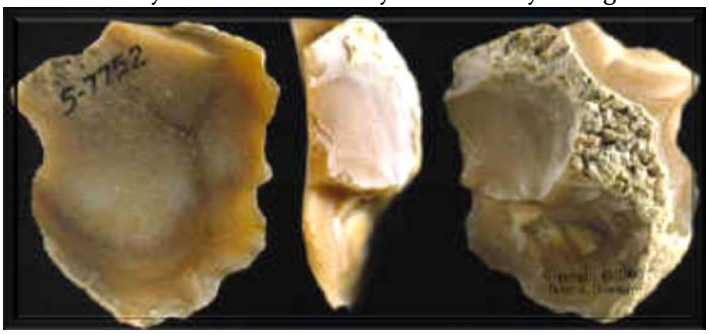
The oldest formally recognized stone tool assemblage in the world is Oldowan. This tradition of making simple flakes struck off unmodified cores began during the Lower Paleolithic period in Africa. The Oldowan stone tool industry was first defined from examples excavated from bed I and bed II at Olduvai Gorge in Tanzania. Paleoanthropologist refer to Homo habilis as the maker of these tools because they appear in the fossil record about the same time or a little later than the earliest Oldowan tools. But there were also several other hominid species living at the same time on Oldowan sites in Africa. So it's a complicated issue as to which one or ones were making the tools.

OLDOWAN CHOPPER CORES
OLDUVAI GORGE, TANZANIA AFRICA

Chopper Cores are among the most common forms of stone tools found on the earliest Stone Age sites in Africa. A large percentage of them are thought to have been made by Homo habilis nearly 1.9 million years ago. They also represent the simplest of stone tool technologies. Some may have been used for food processing operations that involved pounding, breaking or bashing. Other so called Choppers may only have been cores from which flakes were removed that were used for cutting or scraping. Some Oldowan Choppers may have been used for both purposes.

[43] See: http://lithiccastinglab.com/index.htm. 'This web site, unless otherwise stated, is written, designed & the images are credited & copyrighted to Peter A. Bostrom. Technical advisor for all computer software and equipment is Linda Hewitt (my sister).'

OLDOWAN CHOPPER CORE
OLDUVAI GORGE, TANZANIA AFRICA
This Chopper Core was found in Bed II at Olduvai Gorge in northern Tanzania. It's thought to have been made by homo habilis nearly 1.9 million years ago.



OLDOWAN FLAKE TOOL
OLDUVAI GORGE, TANZANIA AFRICA
This unmodified flake represents one of the most important stone tool types made by Homo habilis 1.5 to 2 million years ago. The first deliberately manufactured stone tools were simple flakes struck off an unmodified core. This example is made of chert. Most stone tools from the Lower Paleolithic Oldowan industry at Olduvai Gorge were made from the more common basalt. Basalt is a coarser stone that doesn't allow for reliable edge wear analysis like the denser chert with a higher silica content. Edge wear analysis with the use of a scanning electron microscope allows archaeologists to determine in some ways what types of materials the edges of the stone tool was cutting.
Fig. 14. Source: Lithic Casting Lab. Com: http://lithiccastinglab.com/gallery-pages/oldowanstonetools.htm

Of course, once you get started on quests like these, you're probably going to stray into other territory, finding stones that may be nearly as old, but are found closer to home. For instance, one video on YouTube that caught my London-born eye claims to show 'Lower Palaeolithic Stone Tools' that 'come from the Boyn Hill, Thames River Terrace and were found on Clapham Common, London, England. All came to the surface during construction work in the 1950s ... such as converting the allotments back into common land and deeper digging for drains, sewers etc.'[44]

10. Mediating the archive

[44] See: www.youtube.com/watch?v=wOU_iIiZBeI. The comments include a conversation about the authenticity of the artefacts. And see: www.british-history.ac.uk/report.aspx?compid=22095; the article contains comments on the deposits and also on the scientific value of some of the finds.

The internet archives 'meta' information related not only to a stone and its story, but also to the history of its storytelling. Anyone with an interest in the history of media as well as that of stones, e.g. in the *historiography* of DIY toolmaking, may be thrilled to discover a 1947 film made for the Wellcome Foundation, called *Stone Age Tools: Prehistoric Stoneworking Techniques, part 1*. It is billed as:

> A demonstration by M. Leon Coutier, archaeologist and former President of the *Societe Prehistorique Francaise*, of his technique for making replicas of Palaeolithic tools and weapons, including hand-axes, scrapers, gravers and flint arrowheads. Filmed at the former Institute of Archaeology, Regent's Park, London in June 1947. An important archaeological record. 2 segments.'[45]

Similarly, if you are interested in 'digital storytelling' – that is, in DIY media co-creation – as well as in rocks, you might even be interested my own first attempt at the genre, done as part of a previous research project, and now uploaded on to 'TheQUTube' as a profiling initiative of our university marketing effort. It's called *The Perfect Rock* (Fig. 15). [46]

Fig. 15. *The Perfect Rock*

Talking of the interpenetration of media and minerals, did you know there's even a type of gemstone that's named after television itself? It is a borax-related rock called Ulexite, made of hydrated sodium calcium borate hydroxide. The reason it is called 'TV stone' is that its fibres work rather like fibre-optics and allow suitably polished chunks of it to act as a lens (Fig. 16).[47]

[45] See: www.youtube.com/watch?v=Bu5eqBg5Lr4; and: http://catalogue.wellcome.ac.uk/record=b1663578~S3

[46] See: www.youtube.com/watch?v=fIxu33F8r2w (also via TheQUTube: www.youtube.com/user/TheQUTube#p/search/0/fIxu33F8r2w). This digital story explain my interest in stones as the 'case study' for the probability archive. My interest in digital storytelling can be gauged from: John Hartley & Kelly McWilliam (eds) (2009) *Story Circle: Digital Storytelling Around the World*. Malden, MA: Wiley-Blackwell.

[47] Its chemical formula is: $NaCaB_5O_6(OH)_6 \cdot 5(H_2O)$. See: www.youtube.com/watch?v=isPBecyaZYg.

Fig. 16: Television stone! Source: www.cs.uwaterloo.ca/~shallit/ulexite/tvstone.html

11. Amazingly unlikely

All of these flakes of information lie higgledy piggledy about the internet, easily accessible via one of those stream-of-consciousness searches that can be so pleasurably time-consuming which you're looking for something else. The exercise makes you realise that Google isn't really a 'search-' but a 'find-engine'.[48] It confirms the extent to which knowledge – even individual identity, whether that of an artefact or of the knowledge-seeking subject – is itself a 'found object,' rendered into coherence and meaningfulness not by inner essence but via the pathways of agency that shoot through the potentiality (or 'probability') of an impressively large system, such as the internet, social networks, or neuronal networks in the brain (Fig. 17).[49]

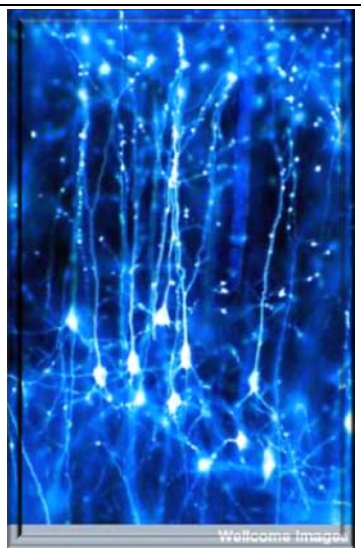


Fig. 17. Neurons, firing.
Source: www.hhmi.org/news/dan20090430.html; via www.medgadget.com/archives/img/neurons_firing.jpg

[48] On the search as 're-finding' see Alexander Halavais (2009) *Search Engine Society*. Cambridge, Polity. And see: Alexander Halavais (2009). 'Knowledge Everywhere.' Media in Transition Conference, Cambridge, Mass. http://web.mit.edu/comm-forum/mit6/papers/Halavais.pdf.

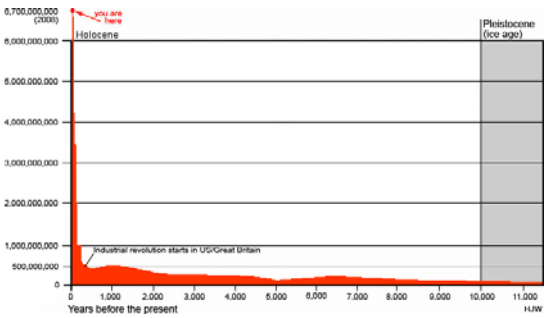
[49] See: www.hhmi.org/news/dan20090430.html; and: www.medgadget.com/archives/img/neurons_firing.jpg

But before we get lost (found?) in cyberspace we must return at last to *improbability* and the Infinite Improbability Drive. When someone from a humanities background becomes aware of impressively large systems, such as the brain's billions of neurons, the billions of individuals in various populations – from bacteria (Fig. 18) to *homo sapiens*[50] – and of course the cosmos where, in Eric Idle's immortal words, 'our galaxy is only one of millions of billions/ In this amazing and expanding universe', then the sensation of improbability is hard to avoid. As Idle so memorably put it:

So remember, when you're feeling very small and insecure,
How **amazingly unlikely** is your birth,
And pray that there's intelligent life somewhere up in space,
'Cause there's bugger all down here on Earth.[51]

Fig. 18. Modern stromatolites, Hamelin Pool, Shark Bay, Western Australia.[52]

[50] See: 'Classification of Human Races' by George Weber: www.andaman.org/BOOK/app-02/text-app02.htm (www.andaman.org/index.htm):



[51] The 'Galaxy Song' by Eric Idle, from Monty Python's *The Meaning of Life* (1983). See: www.youtube.com/watch?v=JWVshkVF0SY. And see my comment on this: http://mediacommons.futureofthebook.org/imr/2007/11/23/a-double-drabble-of-bugger-all-on-monty-python%E2%80%99s-galaxy-song.

[52] See: www.sharkbay.wa.gov.au/tourism/what_to_see_and_do/images/stromatolites_lge.jpg; and http://serc.carleton.edu/NAGTWorkshops/sedimentary/images/stromatolite.html. And see: http://stromatolites.blogspot.com/

Note that these improbabilities – neurons, populations, galaxies – seem to be scale free versions of each other, and note further that the internet is a technological version of the same complex systemic structure. It both enables and is made of individual but networked agency, such that 'identity' begins to look like nothing more essential than the 'firing' of an individual neuron. Note all this and the 'amazingly unlikely' probability of any individual existence, whether of an idea, a bacterium, a human, or a star, becomes at least imaginable *as* an improbability ... of precisely cosmic proportions.

12. The Veblen Question

The possibility that humanities scholars might be particularly fazed by this arises because our discipline is driven by three things that don't 'scale up' very well:

- **meaning**. We tend to prefer in-close investigation of the generative process of individual meanings, in textual analysis, including history and literature;
- **identity**. We are always on the lookout for aspects of individual identity (gender, class, race, sexuality etc.) in ethnographic observation and cultural theory alike;
- **the human**. We are concerned with how 'the human' constitutes itself from within, by philosophy or 'critical theory'.

In short we observe meanings and both individual and collective identity from the perspective of the observer. We are the very product of our own 'observer effect'.[53]

[53] In physics, the term observer effect refers to changes that the act of observation will make on the phenomenon being observed. (Wikipedia: http://en.wikipedia.org/wiki/Observer_effect_%28physics%29).

Fig 19. How unlikely is that? Uncertainty, risk, and user co-creation. An ancient Egyptian statue transformed from 'essence' to 'probability' by myriad subsequent, anonymous users whose purposes remain uncertain. British Museum (Photo: author)

So the challenge of the probability archive for humanities-based disciplinary domains (including cultural and media studies) is not simply a challenge to the status of objects or to our finding, gathering and archiving practices. It is a challenge to our own *mode of knowing* (Fig. 19).

We are, in this respect, in the very same position today that economics was in more than a century ago. In 1898 the American economist Thorstein Veblen published a paper with a provocative question: 'Why Is Economics Not an Evolutionary Science?' Veblen contrasted the 'archaic' or 'animistic' mode of thought, which sought to explain observed phenomena and causes from the point of view of the perception of the individual, with a 'materialistic' or 'modern impersonal method of knowledge', based on a 'systematisation of facts' forced by large-scale technological and industrial processes.[54]

Veblen made the point that the transition from one mode of thought to the other is uneven, and that even the 'classical tradition' of economic theory of his day retained aspects of archaic thought. But a shift from 'animistic' (i.e. humanist) to materialist (i.e. evolutionary) modes of knowledge was, he concluded, only a matter of time:

> Provided the practical exigencies of modern industrial life continue of the same character as they now are, and so continue to enforce the impersonal method of knowledge, it is only a question of time when that (substantially animistic) habit of mind which proceeds on the notion of a definitive normality shall be displaced in the field of economic inquiry by that (substantially materialistic) habit of mind which seeks a comprehension of facts in terms of a cumulative sequence.

Veblen was aware that humanist perceptions were regarded as being on a 'higher' plane, or considered more worthy and of greater 'ceremonial or aesthetic effect', but he was interested in 'cumulative sequence', not values:

> But all that is beside the present point. Under the stress of modern technological exigencies, men's everyday habits of thought are falling into the lines that in the sciences constitute the evolutionary method; and knowledge which proceeds on a higher, more archaic plain is becoming alien and meaningless to them. The social and political sciences must follow the drift, for they are already caught in it.

[54] Thorstein B. Veblen (1898) 'Why Is Economics Not an Evolutionary Science?' *Quarterly Journal of Economics*, 12(3), July, 373-97. Full text here: http://socserv.socsci.mcmaster.ca/oldecon/ugcm/3ll3/veblen/econevol.txt.

One of those 'modern technological exigencies' is the probability archive. It tells us that the essence of objective, individual identity is a semiotic outcome of display and narrative, not a property of objects or of people. The probability archive teaches us that the achievement of any particular identity is almost infinitely improbable. Nonetheless, it is organised, systematic and predictable – at least in terms of overall (population-wide) probabilities. There's even a machine that demonstrates how order does indeed emerge from such chaotic complexity. It is called the Probability Machine or the Galton Board, after the mathematician Sir Francis Galton (Fig. 20).[55]

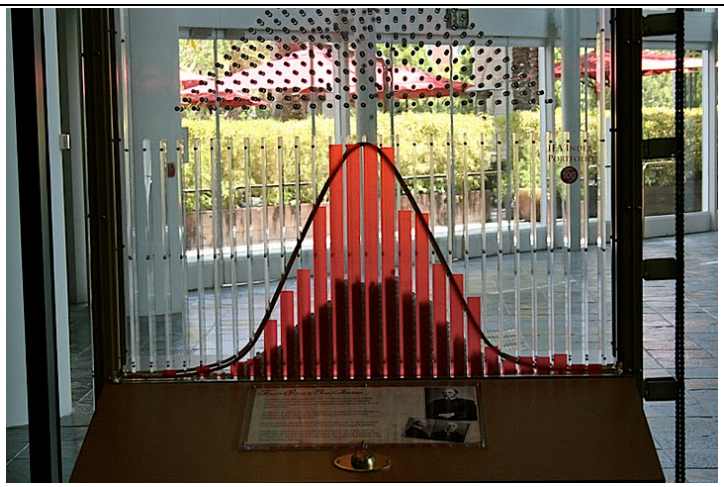


Fig. 20: Probability Machines: Source: http://picasaweb.google.com/indexfundsadvisors/ProbabilityMachines#

Humanities-based disciplines, even those with a strong interest in technological systems like the media and the internet, have been slow to transform their own 'mode of knowing.' They are still bound to 'essence' issues such as determinism (in the last instance) by identity, authenticity, place. Thus, if what Veblen calls 'men's everyday habits of thought' are better explained by probability theory and 'cumulative sequence', then there is a disciplinary imperative to move beyond our own habitual thinking and shift our disciplinary gaze from the critique of *essence* to the embrace of *probability*, including a 'quantum' understanding of uncertainty and risk, and an evolutionary approach to the dynamics of change in our chosen domains of meaning, identity and the human. These are the probabilities that hover around us in the 'cloud culture' of the internet when we use it to investigate the growth of knowledge.

[55] For a 'real' probability machine, see: IFA.com - Sir Francis: Probability Machine, Galton Board, Randomness Simulator, Quincunx: www.youtube.com/watch?v=AUSKTk9ENzg (this is the 'pedagogic' model); and see: www.youtube.com/watch?v=9xUBhhM4vbM (this is the 'Hollywood/marketing' model); and see: www.youtube.com/watch?v=oVt-LdF2BTU&feature=watch_response_rev (this one shows what happens when you let Schrödinger's cat touch your iPad).